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New species and new records of *Crepidotus* from the northwest region of São Paulo State, Brazil

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Abstract — The study of *Agaricales* collections gathered in the northwest region of São Paulo State, Brazil revealed the occurrence of four species of *Crepidotus*. Two of them, *C. flavus* and *C. longicystidiatus*, are proposed as new, while *C. apodus* and *C. defibulatus* are recorded for the first time in the northwest region of São Paulo State.

Key words — diversity, South America, taxonomy

Introduction

The genus *Crepidotus* (Fr.) Staude includes members with a lignicolous habit, pleurotoid basidiomata often bearing a reduced stipe, and pilei that are glabrous to densely villose especially near the rear portion. The spore print is in shades of pale brown or sometimes yellowish, and spores that may be smooth or ornamented but which always lack a germ pore. Pleurocystidia are normally absent, but cheilocystidia are mostly present. Hyphae may be clamped or not.

Spore ornamentation and the presence or absence of clamp connections are the basis of infrageneric classification in *Crepidotus* by Singer (1947, 1973) and Hesler & Smith (1965). In her study of European species, Senn-Irlet (1995) based her infrageneric classification on pileus trama type, including the presence or absence of a gelatinous layer.

In Brazil, *Crepidotus* is represented by 36 taxa, of which 10 — *C. apodus*, *C. applanatus* var. *subglobiger*, *C. candidus*, *C. catamarcae*, *C. crocophyllus*, *C. defibulatus*, *C. martinii*, *C. palmarum*, *C. polylepidis*, *C. quitensis*, *C. rubriceps*, *C. scymnodes*, *C. stromaticus*, *C. tigrensis*, *C. uber, C. variabilis* — occur in São Paulo State (Capelari 2007). Paraná and Rio Grande do Sul are the states with the next highest numbers of known species (Senn-Irlet & Meijer 1998, Rick 1930, 1938, 1961). Singer (1989) cited two species for Amazonas (*C. igapoensis*,

C. pilosiceps), which are known only by the types. Singer (1973) described *C. guzmanii* and mentioned *C. truncatus* for Pernambuco State. For the state of Rio de Janeiro, Singer (1973) cited *C. albidus* var. *bisporus* and both he and Bandala et al. (2006) mentioned *C. septicoides*.

This paper, which deals with collections from forest fragments in the northwest region of São Paulo State, proposes two new species: *C. longicystidiatus* and *C. flavus*.

Materials & methods

Materials were collected in four private forest remnants within the northwest region of São Paulo State. These remnants are composed of semideciduous seasonal forest, which is very fragmented and surrounded by either sugar cane or orange plantations or pasture. The human impact on these places probably will not be reverted and they tend to disappear.

For microscopic analyses, dried material was rehydrated in 70% ethanol followed by 5% KOH. For spore and cheilocystidia dimensions, 20 measurements were taken for each specimen; Qm represents the mean length/width quotient of the total spores measured. All microscopic illustrations were made with the aid of a drawing tube. The colors of fresh material, when possible, were compared with those described by Küppers (1979), and the specimens were deposited at the herbarium of the Instituto de Botânica (SP).

Taxonomy—new species

Crepidotus flavus Capelari, **sp. nov.** Figs 1a, 2

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Pileus 3–17 mm latus, flabellatus, flavus vel ochraceus, brunneus prope substrato, pruinosus, margine flava vel ochracea, involuta. Lamellae adnatae, flavae vel ochraceae. Stipes nullus. Basidiosporae 8.7 × 8.7 µm, globosae, valde verruculosae. Pleurocystidia nulla. Cheilocystidia 19.3–29.2 × (5.2–) 7.0–9.2 µm, numerosa, flageliformia, leavia, interdum cum apicibus incrustatis. Trama pileorum flavida, hyphae fibulatae, 6.2–12.5 µm latae. Trama lamellarum regularis, flavida, hyphae fibulatae, 6.2–8.7 µm latae. Pileipellis ex hyphis repentibus vel erectiusculis, fibulatis. Gregarius, supra trunco caduco.

Type: Brazil, SP, Matão, (21°37'14"S 48°32'14"W), 12 December 2007, F. Karstedt 1011 (**holotypus** in herbarium SP asservatur).

Etymology: Latin, yellow, the basidiomata color.

Macrocharacters: Pileus 3–17 mm broad, flabelliform, yellow to ochraceous, brown near the attachment to the substrate, margin yellow to ochraceous yellow, pruinose at the rear portion, dry, not hygrophanous, margin plane to slightly incurved, smooth. Lamellae adnate, diverging from a common central point, distant, with 1–2 series of lamellulae, yellow to ochraceous. Stipe absent. Context yellowish, thin.

Microcharacters: Basidiospores 8.7 × 8.7 µm, $Q_m = 1.0$, uniformly globose, ornamented, strongly verrucose, light brown, thick-walled, inamyloid. Basidia

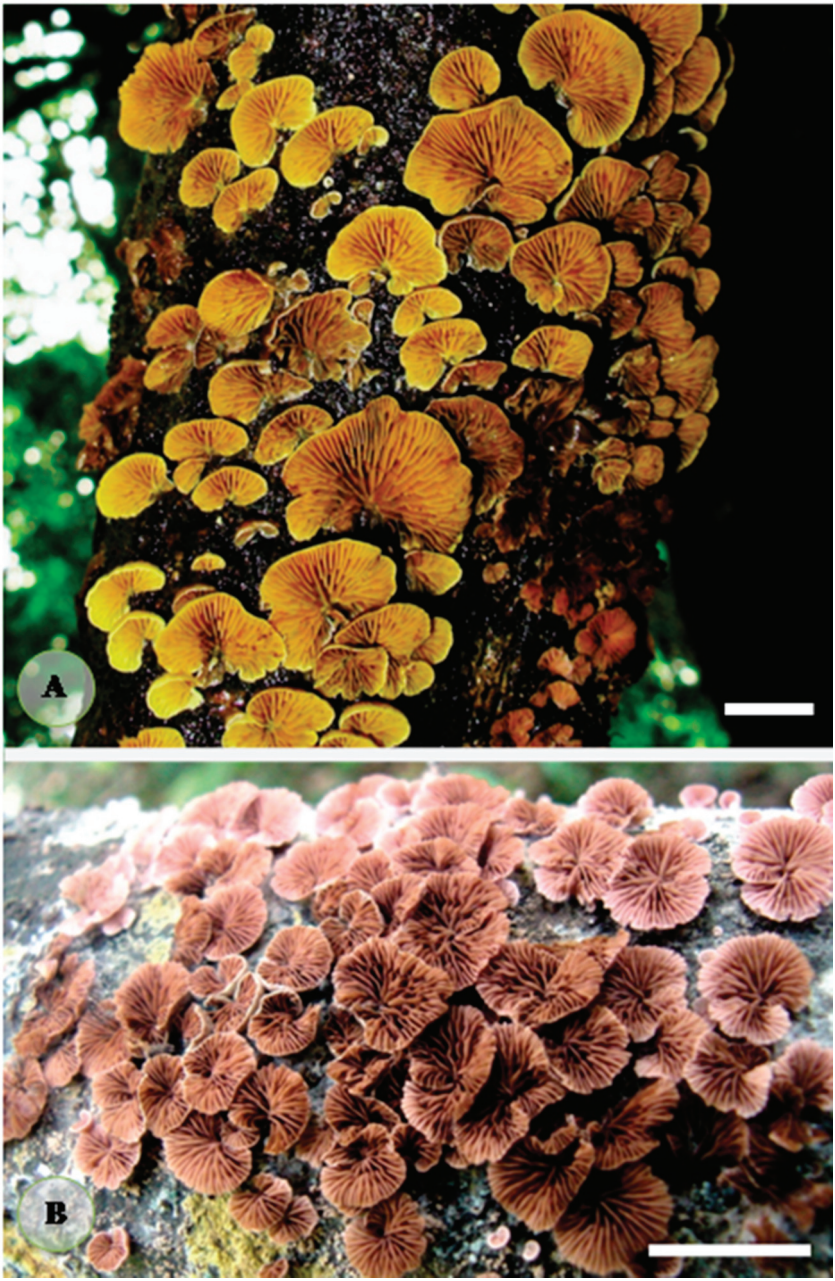

Fig. 1. A. *Crepidotus flavus* (type); B. *Crepidotus longicystidiatus* (type). Bars = 1 cm.

not seen. Pleurocystidia absent. Cheilocystidia 19.3–29.2 × (5.2–)7.0–9.2 µm, numerous, turning the margin completely sterile, ventricose, smooth, hyaline, thin-walled, some with apical encrustations, clamp connections at the base not seen. Pileus trama thin, yellowish, with cylindrical, thin-walled hyphae, 6.2–12.5 µm diam, hyaline, clamped, ungelatinized. Hymenophoral trama regular, yellowish, with cylindrical, slightly thin-walled hyphae, 6.2–8.7 µm diam, hyaline, clamped, ungelatinized. Pileipellis light brown, a cutis of prostate to some loose and suberect yellowish to light brownish hyphae, 3.7 µm diam, thick-walled, clamped.

Habit and habitat: Gregarious, on fallen trunk.

Comments: Macroscopically, this material fits very well with the illustration of *Crepidotus stromaticus* (Cooke & Masse) Sacc. published by Hemmes & Desjardin (2002). According to these authors, *C. stromaticus* from Hawaii had been previously referred to *C. citrinus* Petch and *C. sulphurinus* Imazeki & Toki. Literature on *C. stromaticus* is limited, although it was cited for Brazil by Rick (1961) in material that needs revision.

Pilát (1950) described the Australian type material of *C. stromaticus* as "*albido-isabellino . . . Pileus 10–15 mm. latus . . . Sporae . . . distincte dense obtuse verrucosae, 8–8.5 × 6.7–7.5 µ*", and considered it identical to *C. pogonatus* (Kalchbr.) Sacc. However, in the same paper, he described the basidiospores of *C. pogonatus* as "*punctato-verrucosae . . . 5–5.6 µ diam.,*" much smaller than he measured for *C. stromaticus*. On the other hand, Singer (1955) described the type of *C. stromaticus* as "strongly punctate and somewhat rough, about 7–7.5 µm in diameter" and regarded *C. stromaticus* so close to *C. nephrodes* that a specific separation could hardly be justified. Information by Ripková et al. (2005) and Bandala et al. (2008) suggests that *C. nephrodes* is a different taxon and should even be considered a synonym of *C. crocophyllus*, a broadly distributed temperate fungus with variable pigmentation that was already mentioned for São Paulo State by Rick (1930, 1961).

Crepidotus sulphurinus (Imazeki & Toki 1954), according to the protologue, has bisporic basidia and basidiospores that are 7–10 × 6–9 µm, subglobose, apiculate, brownish-yellow, and echinulate-verrucose. *Crepidotus flavus,* on the other hand, produces truly globose, perhaps less ornamented basidiospores (as far as I know there are no available MEV photographs of *C. sulphurinus*), and ventricose cheilocystidia (some apically encrusted) and not clavate as illustrated by Imazeki & Toki (1954).

Singer (1953) identified a yellow *Crepidotus* from Argentina as *C. citrinus* growing together on the same trunk with another species he identified as *C. fulvifibrillosus* Murrill, which Ripková et al. (2005) consider a synonym of *C. crocophyllus*. *Crepidotus citrinus* was described from Sri Lanka and, according

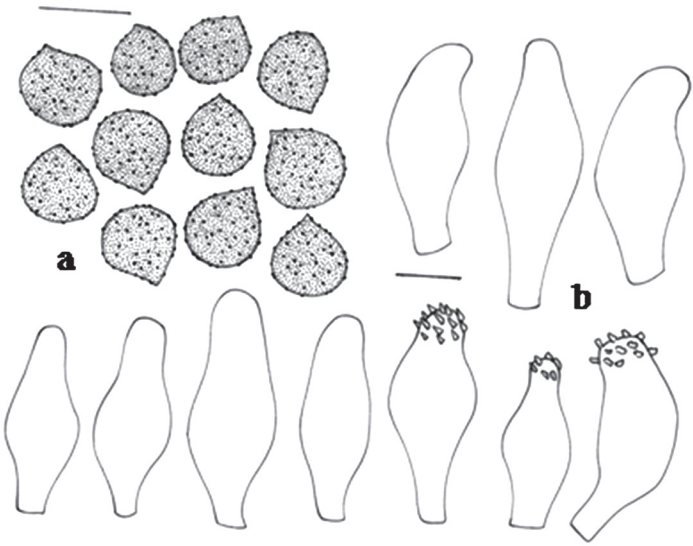

Fig. 2. *Crepidotus flavus* (type):
a. basidiospores; b. cheilocystidia. Bars = 10 µm.

to Singer (1955), the type has globose basidiospores that are 7–8 × 7–8 µm, with strongly imbedded spinules that project slightly beyond the episporium so that the spore surface appears rough in immersion oil. Singer (1955), however, did not mention cheilocystidia size and shape. The Argentinean material of the same species described by Singer (1953) has globose basidiospores that are 6.8–8.3 µm, 2-, 3-, or 4-spored basidia, and hyaline to light yellow versiform cheilocystidia, the majority of which have irregular excrescences but lack encrustations and which measure (15.0–)27.5–42 × (4.0–)6.8–11(–14.5) µm. No other modern description of *C. citrinus* was found in order to clarify the cheilocystidia. Indeed, *C. citrinus* sensu Singer appears to be the closest species to the new Brazilian one, but they differ in cheilocystidia shape and size.

Horak (1978) described two species with yellow colors and encrusted cheilocystidia—*C. aureus* from New Caledonia and *C. parietalis* from New Zealand—that can be compared with *C. flavus*. *Crepidotus flavus* differs from *C. aureus* in basidioma dimensions, less ornamented pileus surface, and basidiospore and cheilocystidial morphology, with *C. aureus* producing smaller (6–7 µm), subglobose spores and cheilocystidia that are fusoid to lageniform, basally thin-walled and apically thick-walled (≤ 1.5 µm). From *C. parietalis*, *C. flavus* differs in pileus color (paler in *C. parietalis*) and especially by the basidiospore dimension and shape (5–6.5 µm and globose in *C. parietalis*) and the absence of thick-walled hyphae at the pileipellis.

Crepidotus longicystidiatus Capelari, **sp. nov.** Figs 1b, 3

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Pileus 3–7 mm latus, primum flabellatus, deinde convexus vel plano-convexus, dorsaliter affixus in substrato tum circularis vel reniformis, subroseus, pilosus; margine plana ad involutam. Lamellae adnatae, vinaceo-roseae. Stipes nullus. Basidiosporae (6.2–)7.5(–8.7) × 6.2–7.5 µm, globosae vel subglobosae, verruculosae. Basidia 20–25 × 5.0–6.0 µm, clavata, tetraspora. Pleurocystidia nulla. Cheilocystidia 60–116 × 5.0–7.0 µm (14.0 µm apicem), cylindracea ad flexuosa, hyalina, cum fibulis in base. Trama lamellarum regularis, hyphae fibulatae, 6.2–11.2 µm latae. Pileipellis ex hyphis repentibus composite, fibulatae, 6.2–10.0 µm latis. Gregarius ad ramo putridos.

Type: Brazil, SP, Turmalina, (20°00'13"S 50°26'02"W), 27 November 2007, Capelari 4358 (**holotypus** in herbarium SP asservatur).

Etymology: Latin, because of the very long cheilocystidia.

Macrocharacters: Pileus 3–7 mm broad, flabelliform in primordial stages, becoming convex or plane-convex, dorsally attached to substrate, then circular, subcircular or more or less reniform when seen from hymenophore, light pinkish, dry, not hygrophanous, surface pilose, margin plane to incurved, smooth. Lamellae adnate to a common central or excentric point, distant, wit 1–2 series of lamellulae, vinaceous pink (near $N_{50}A_{60}M_{70}$), edges lighter. Stipe absent. Context thin.

Microcharacters: Basidiospores (6.2–)5.0–7.0(–8.7) × 6.2–7.5 µm, Q_m = 1.19, globose to subglobose, ornamented, verrucose, ferruginous-brown, slightly thick-walled, inamyloid. Basidia 20–25 × 5.0–6.0 µm, clavate, four-spored, hyaline, thin-walled. Basidioles numerous. Pleurocystidia absent. Cheilocystidia 60–116 ×5.0–7.0 µm, up to 14.0 µm at the apex), numerous, cylindrical, narrowly clavate, flexuous, smooth, hyaline, slightly thin-walled, clamped at the base. Pileus trama thin, of cylindric, slightly thin-walled hyphae, 6.2–10 µm diam, hyaline, clamped, ungelatinized. Hymenophoral trama regular, of cylindric, slightly thin-walled hyphae, 6.2–11.2 µm diam, hyaline, clamped, constricted at the septum, ungelatinized. Pileipellis a cutis of undifferentiated flexuous hyphae, 6.2–10 µm diam, hyaline to slightly brownish, slightly thick-walled, clamped, with small clamp connections. Pileus hyphae at the substrate hyaline slightly brownish hyphae, 2.5–3.7 µm diam, moderately thick-walled, sometimes encrusted, branched, clamped.

Habit and habitat: Gregarious, on fallen branch.

Comments: Of the species with pink or pinkish pilei or lamellae, the new species can be compared with *C. roseus* Singer, *C. roseolus* Singer, and *C. velutinoaffinis* Singer, described in Singer's 1973 monograph of *Crepidotus* for the Neotropics.

Crepidotus roseus differs in basidiospore morphology and cheilocystidia size and is characterized by less broad (6.5–7.0 × 5.3–5.8 µm) subglobose basidiospores and smaller (30–48 × 7.5–13 µm) cheilocystidia. The new

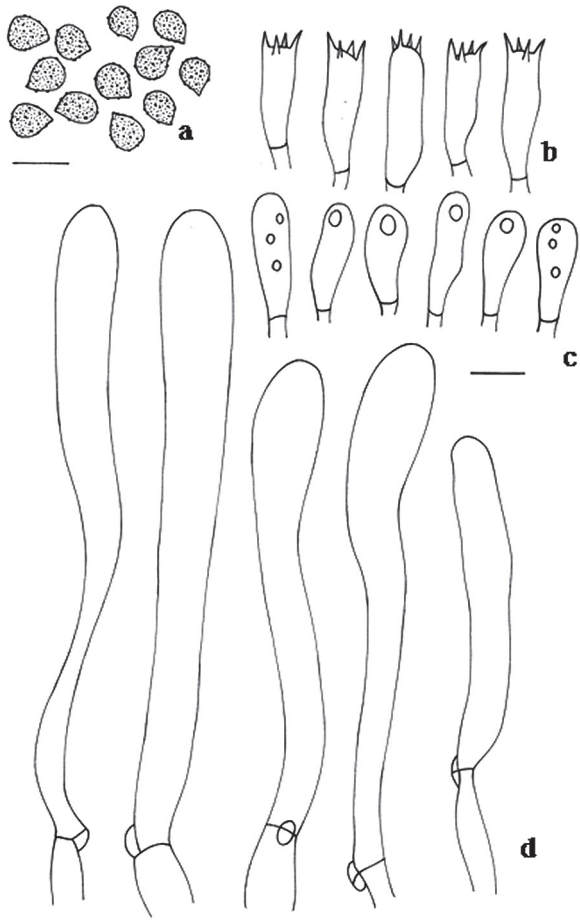

Fig. 3. *Crepidotus longicystidiatus* (type):
a. basidiospores; b. basidia; c. basidioles; d. cheilocystidia. Bars = 10 μm.

species differs similarly from *C. roseolus*, which has smaller (5.0–6.2 μm, most ~5.5 μm) punctate globose basidiospores and cheilocystidia that are 32–35 × 6.7–9.3 μm, ventricose in the lower and upper portions and slightly constricted in the middle, and often with one or two finger-like appendages. *Crepidotus velutinoaffinis* differs in its small (2 × 1 mm) stipe (lacking in *C. longicystidiatus*) and cheilocystidia, which are 40–61 × 3.8–7 μm, cylindric or cylindric-subclavate to slightly ventricose with apices that are mostly subcapitate or at least slightly constricted just below the apex or occasionally equal and rounded or attenuate (rarely acute).

Crepidotus rubrovinosus Bandala et al. (2006), with a reddish or red-wine pileus described from Mexico, differs in its persistently reddish fimbriate lamellar edges, oblong/ellipsoid basidiospores with a suprahilar depression and ornamentation comprising short, broad and sinuous blunt bulges and ridges that often anastomose to form a subreticulate pattern, and cheilocystidia that are cylindric-clavate to clavate, narrowly utriform, 35–138(–147) × 3–7(–8) µm, occasionally septate, sinuous toward the base, apex rounded or subcapitate, rarely attenuated, and, at times, bifurcate or lobate (Bandala et al. 2006).

Taxonomy—new records

Crepidotus apodus Capelari, Hoehnea 34: 76. 2007.

Material examined: Brazil, SP, Onda Verde, 20°2'08"S 48°49'35"W, 09 December 2008, Capelari 4426 (SP).

Comments: *Crepidotus apodus* produces many very small yellowish basidiomata that colonize shrubs on the forest floor. It was described from Parque Estadual das Fontes do Ipiranga (south of São Paulo city), and since its publication, it has frequently been collected in other protected areas of São Paulo State. Description and illustrations can be found in Capelari (2007).

Crepidotus defibulatus Singer, in Singer & Digilio, Lilloa 25: 410. 1952 ["1951"].

Material examined: Brazil, SP, Turmalina, 20°00'13"S 50°26'02"W, 27 November 2007, Capelari 4348 (SP).

Comments: *Crepidotus defibulatus* is one of the few *Crepidotus* species with ornamented basidiospores and clampless hyphae. It occurs in Argentina (Singer 1973, type locality) and São Paulo State, Brazil (Capelari 2007). Descriptions can be found in Singer & Digilio (1952), Singer (1973), and Capelari (2007, with illustrations).

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